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ABSTRACT

This report is an evaluation of a New York City school district educational project funded under Title I of the Elementary and Secondary Act of 1965. The major objective of the program was to increase student competency in math computational skills. Approximately 3,000 high school students in grades 9 through 11 from 32 high schools were selected as participants. Class size was reduced to 15 students to allow for individualized instruction. Math labs equipped with calculators, printing calculators and programmable calculators were available for student use. Their use was designed to interest students in math and to make students familiar with these machines since they are often used in business and might increase students' employment opportunities. The program was staffed by a project coordinator, teacher-trainers, teachers, and teacher-aides. The Metropolitan Achievement Test (MAT) Computational Sub-Test was administered as a pretest and as a posttest. A historical regression analysis of the achievement test data revealed statistically significant differences in the scores. Program participants, on the average, made one year gains in actual achievement beyond that which was predicted on the basis of their previous history of achievement. (Author/BS)

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EVALUATION REPORT

Function No. 09-59678

REMEDIAL MATHEMATICS SKILLS PROGRAM FOR OPTIONAL ASSIGNMENT PUPILS

SCHOOL YEAR 1974-75

Sheldon B. Kastner, Ph.D.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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An evaluation of a New York City School district educational project funded under Title I of the Elementary and Secondary Education Act of 1965 (PL 89-10) performed for the Board of Education of the City of New York for the 1974-75 school year.

Dr. Anthony J. Polemeni, Director

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Chapter I: The Program

The main objective of this program is to improve achievement in fundamental mathematics skills in high school who are two or more years retarded in mathematics.

Project Activities:

The basic premise of this program is that high school students who have not as yet demonstrated competence in basic arithmetic operations and concepts, need special attention. To meet the special needs of these students the program is designed to provide "individualized" instruction. In addition, small group instruction and full class instruction were also used when appropriate. The process of individuation required the teacher to design a remedial mathematics program which focused on the particular needs of each student. To implement such a program the teacher had to be knowledgeable in mathematics and its application, familiar with various materials and equipment, as well as be able to motivate students by planning meaningful activities.

Class sizes have been reduced to approximately 15 students per class to allow for greater individualized instruction. Math labs are equipped with hand operated calculators, printing calculators and programmable calculators. The use of calculators, desk and programmable, is one of the most innovative features of the program. The machines are used to encourage students to explore many aspects of mathematics. In addition, the machines are often found in many businesses and the students familiarity with their operation may aide their employment opportunities. The machines can be used to provide immediate feedback and thus indicate areas where further practice is

needed.

Each classroom is staffed by a teacher and a teacher-aide. The teacher-aides duties include one-to-one instruction, development of materials, and clerical. A teacher-trainer is available to each school to assist in the organization and implementation of the program. Teacher-trainers provide information concerning materials, equipment, and ideas for teacher prepared materials. Consultations between teachers and teacher-trainers take place at home schools or at the Bureau of Mathematics. Such consultations also allow for an exchange of ideas which have proven successful in other classrooms.

Subjects:

The criteria for selection of student participants were Optional Assignment Title I high school students who were at least two years retarded in computational skills as determined by the most recently administered standardized test. These are pupils who are unable to complete their mathematics requirement for the diploma. Students are recommended for the supplementary program by the mathematics or business education department chairperson, teacher, grade advisor or guidance counselor. Within 15 school days after the component was implemented, a list of student participants was formulated. The list contained the following information: name, class, grade, home address, standardized test score used for his selection, name of test, and date of administration. Participating pupils attend the supplementary math class five times a week for one period per day. Class size was 15-20 students. Diagnostic testing was done at the beginning of the program and an individualized remedial prescriptive program was prepared for each student. Remedial prescription was assigned on a daily, weekly or monthly basis. Each set of lessons

were designed to overcome a single skill deficiency. As each difficulty was overcome the process was repeated for another area of deficiency. Progress is recorded and checked by the teacher or educational assistant.

Thirty-two high schools participated in the Remedial Math Skills Program for Optional Assignment. Twenty-four high schools participated for the entire year (September 1 - June 30, 1975). Eight high schools ran the program from February 1975 to June 1975. A total of 3125 pupils were to be serviced by the program. The supplementary classes were run during the regular school day between the hours of 8:30 a.m. and 5:00 p.m.

Chapter II: Evaluative Procedures

Program Objective I: Pupils participating in the Optional Assignment Math program will show a significant increase in computational skills as measured by the Computation Test of the Metropolitan Achievement Test.

Evaluation Objective I: To determine whether, through participation in the Optional Assignment Math Program, the computational scores of the target population will improve significantly as measured by the MAT Computation Sub-test.

Subjects: All pupils who have participated in the supplementary Optional Assignment Math Program.

Methods and Procedures: The appropriate forms of the MAT Math Computation Sub-test was administered at the beginning and end of the program. Testing dates were as follows:

Pre-test	Post-test
September, 1974	February, 1975
February, 1975	May, 1975

Pupils on one semester cycles were pretested either in September, 1974 or February, 1975 and posttested in either February or May, 1975. Pupils on two semester cycles were pretested in September, 1974 and were posttested in May, 1975. Alternate forms of the MAT were used for pre- and posttesting. The Advanced High School Level of the MAT was used.

Data Analysis: Data was analyzed by the "Real Post-test versus Anticipated Post-test design". A "t" test for correlated data was used to determine significance level. The .05 level of probability was used as an indicator of level of significance.

Evaluation Objective II: To evaluate the extent to which the program, as actually carried out, coincided with the program as described in the project proposal.

Subjects: All participants in the program.

Methods and Procedures: In order to evaluate the quality and extent to which the program has been implemented, close monitoring of the program was carried out by conducting site visits, by examining documents related to the implementation of the program, and by maintaining continuous contact with the project coordinator in order to obtain data on all aspects of the functioning of the program.

Analysis of Data: A statement concerning the extent of implementation will be made in a later section.

Chapter III: Findings

Evaluation Objective I: To determine whether, through participation in the Optional Assignment Math Program, the computational scores of the target population will improve significantly as measured by the MAT Computation Sub-test.

Table 1 contains the data relevant to the first evaluation objective.

Table 1

Historical Regression Analysis

MAT Mathematics Computations Sub-test

Grade Level	N	Pre-Mean	Predicted Post	Actual Post	't'	p
9	925	5.90	6.22	7.18	24.56	.001
10-11	1535	6.33	6.63	7.52	32.91	.001

The data contained in Table 1 has been grouped by grade (9th and 10-11th). The data for 9th graders in the program indicates that their actual post-test scores in Math computation was significantly greater than their predicted post-test scores. A comparison of the mean actual post-test scores with the predicted post-test scores indicates a .96 difference between the two means. This .96 difference indicates that participants in the program showed nearly a full year growth in Math Computation above what would have been predicted based on their past history of computational achievement. A test of significance between actual post-test scores and anticipated post-test scores

reveals highly significant difference (.001) with the actual post-test score being higher. The data for 9th graders supports the program objective of increasing Math computational skills.

Table 1 also contains data for 10th and 11th graders. The data for 10th-11th graders also supports the program objectives of increasing Math Computational skills. A comparison of actual post-test scores with predicted post-test scores indicates a .9 difference. Consistent with the 9th grade data the actual post-test computational scores are nearly a year higher than the predicted computation scores. Test of significance indicates that this difference (actual versus predicted) is highly significant (.001).

In summary, the data in Table 1 for 9th and 10th-11th graders supports the program objective which stated that as a result of participating in the program students will show a significant gain in Math computation as when MAT scores are analyzed by a "Real Post-test vs. Post-test design".

Discrepancy Analysis:

The degree to which the program was implemented as described in the project was evaluated by site visits, contact with the coordinator, and examination of documents related to program implementation.

Site visits focused on evaluation of adequacy of facilities, materials, and equipment. Interviews were also conducted with teachers and educational assistants. Among the schools visited the facilities assigned to the Optional Math Program varied from excellent to adequate. In all cases, as called for in the guidelines, a special room was set aside for the math program. Rooms were equipped with adequate electrical outlets so that machines could be effectively used. Most rooms had adequate space to avoid overcrowding between

students using machines and those using workbooks. In many instances schools provided facilities which were near perfect lab set-ups. To further enhance the program many of the rooms were physically set apart from other classrooms. This allowed for privacy and a quiet atmosphere which aided motivation. In older schools the program was often housed in a regular classroom with unmovable desks and chairs. Such set-ups with permanent fixtures tended to make the program more difficult to implement. However, all facilities visited were at least adequate and within guidelines presented in the original proposal. All facilities had electrical outlets for calculators, security closets, space for supplies and file cabinets for students' work and records.

Materials, Equipment and Supplies:

Interviews about materials, equipment and supplies with teachers at the various schools indicated general satisfaction with delivery of materials. All teachers reported receiving a full compliment calculators and adding machines. There were reports of machines needing repairs and some delay in obtaining such repairs. There was a clear cut procedure for reporting of repairs to the central office. Workbooks, math games, and other materials were plentiful and prominently displayed and within easy access of students. Some teachers felt some material and books were of particular value and would have preferred greater quantities of such materials. File cabinets, closets with locks, and file folders were available at all sites. The program had adequate materials, equipment and supplies. Observations made on site visits indicated that facilities were supplied with materials described in the program proposal.

Teachers and Educational Assistants:

As a group the teachers and educational assistants were motivated, sensitive and interested in their students. Most were very enthusiastic about the program. Interviews with teachers revealed that they were knowledgeable about program objectives. They also indicated that their contact with the teacher-trainers were quite helpful. Such interchanges with teacher-trainers provided information concerning use of machines and equipment, new materials, and ideas for working with students with special problems. Educational assistants were an integral part of the program. Educational assistants worked with individual students and small groups. They also helped with clerical functions and record keeping which allowed the teacher more time for direct instruction. The educational assistants' enthusiasm and rapport with the students is a major element of the success of the program.

Teacher-Trainers:

Information concerning teacher-trainers was obtained through direct meetings with trainers, discussions with teachers, assistants, and project coordinator. The most relevant indicator of the success of the teacher-trainer would appear to be the teachers and assistants feelings about the degree to which the trainer was helpful. From interviews conducted with the teachers and educational assistants the clear impression was that teacher-trainers were of great importance to the success of the program. Teacher-trainers provided many helpful teaching and organizational suggestions. They also serve as a vital link between the schools and the central math office. Thus requests for materials, supplies and repairs for equipment could be filtered through the teacher-trainer. Trainers also aided in the evaluation

process by providing test materials and receiving data collection sheets. In addition, to direct contact with teachers at the schools the trainers also were involved in the organization and implementation of training seminars.

Project Coordinator:

The project coordinator displayed a great deal of skill in efficiently managing a complex program. His responsibilities included selection and distribution of materials and equipment, in-service training, the development of program objectives, and the coordination of the data gathering process. Administration tasks were carried out in an organized and effective manner. Teachers reported having received sufficient materials and supplies, repair of equipment was promptly handled, and the data collection process was well organized. Program priorities and objectives were clearly stated and effectively transmitted to teachers, trainers, and educational assistants through the project coordinator's office.

In summary, it was evident that the program was implemented in a manner which was consistent with the guidelines set forth in the original project proposal. Adequate facilities were found at all sites visited. Class size was reduced to between 15-20 students per session. A check of the student rosters indicated that all students enrolled in the program were at least two years behind in computational skills. Materials, supplies and equipment were issued to all schools. Calculators and other electronic equipment as described in the proposal were in use in all remedial classrooms. Individualized instruction in the form of one to one and small group instruction was observed on site visits. A check of teacher schedules indicated that each teacher was scheduled for five remedial classes as stated

in the project proposal. Teacher-trainers were observed to have made regular visits to their assigned schools.

Implementation of Previous Recommendations:

The following are some of the recommendations which were made in the 1973-74 evaluation report:

1. Hiring of an assistant to the coordinator.
   a. This recommendation has been implemented.
2. A more intensive training program.
   a. The addition of teacher-trainer positions and the experience gained from last years program the training program appears to have become more effective.
3. A supportive atmosphere that encourages students to learn without embarassment.
   a. This recommendation has been most sucessfully implemented in those schools with flexible physical arrangements. Some schools were able to set up attractive labs in areas which were relatively private. Students could thus enter the rooms without feeling conspicuous.
4. Program should be recycled.
   a. This is being done.

Chapter IV: Summary, Conclusions, and Recommendations

The major objective of the Remedial Mathematics Skills Program for Optional Assignment was to improve the computational skills of the program participants. Approximately 3000 9-11th grade high school youngsters who were at least two years behind in computational skills were selected to participate in the program. The program was geared toward individualized instruction utilizing a variety of

materials and electronic equipment. Historical regression analysis of pre- versus post-test achievement test data indicated statistically significant differences. Students participating in the program showed on average approximately a year gain above what had been predicted based on their previous computational achievement.

These significant findings are supportive of the major program objective. The recommendations which follow are based on the sucessful findings that the program has achieved.

1. The program should be recycled.
2. Because of the encouraging findings the scope of the program should be broadened to include other areas of mathematics, e.g., problem-solving.
3. The possibility of coordinating the math program with the remedial reading program should be explored. Both programs seem to be dealing with similar youngsters and a program integrating reading and math would appear to be a useful combination.

Chapter V: Exemplary Program Abstract

Component Identification: 60916-720-801

The major objective of the Optional Assignment Math Program was to increase the computational skills of high school students who were at least two years behind in their math computational skills. The instructional philosophy of the Optional Assignment Program was individualized instruction. In addition to individual and small group instruction innovative use of mechanical and electrical calculators was an integral part of the program. Students upon entering the program were given diagnostic tests and from this information an individual remedial program was constructed. Teachers and teaching assistants received guidance in program development from teacher-trainers. The overall program was efficiently managed. All facets of the program were integrated and resulted in a highly effective program. Data analysis indicated that participants in the program showed, on average, approximately a one year gain in actual computational achievement beyond that which was predicted based on their previous history of achievement. Approximately 3000 high school youngsters participated in the program.

REMEDIAL MATHEMATICS SKILLS PROGRAM FOR OPTIONAL ASSIGNMENT PUPILS
Function No. 09-59678

Use Table 30A. for Historical Regression Design (6-Step Formula) for Reading (English); Math (English); Reading (Non-English); Math (Non-English).

30A. Standardized Test Results.

In the Table below, enter the requested information about the tests used to evaluate the effectiveness of major project components/activities in achieving desired objectives. This form requires means obtained from scores in the form of grade equivalent units as processed by the 6 step formula (see District Evaluator's Handbook of Selected Evaluation Procedures, p. 45-49). Before completing this table, read all footnotes. Attach additional sheets if necessary.

Component Code	Activity Code	Test Used[1]	Form Pre	Form Post	Level Pre	Level Post	Total N[2]	Group I.D.[3]	Number Tested[4]	Pretest Date	Pretest Mean	Predicted Posttest Mean	Actual Posttest Date	Actual Posttest Mean	Statistical Data: Obtained Value of t	Statistical Data: Level of significance[5]
609151	720	MAT	G	F/H	ADV	ADV	1175	9th	925	10/74 2/75	5.90	6.22	5/75	7.18	24.56	<.001
609161	720	MAT	G	F/H	ADV	ADV	1950	10-12	1535	10/74 2/75	6.33	6.63	5/75	7.52	32.91	<.001

1/ Identify the test used and year of publication (MAT-58, CAT-70, etc.).
2/ Total number of participants in the activity.
3/ Identify the participants by specific grade level (e.g., grade 3, grade 5). Where several grades are combined, enter the last two digits of the component code.
4/ Total number of participants included in the pre and posttest calculations.
5/ Specify level of statistical significance obtained (e.g., $p \leq .05$; $p \leq .01$).

OFFICE OF EDUCATIONAL EVALUATION - DATA LOSS FORM

(attach to MIR, item #30) Function # 09-59678

In this table enter all Data Loss information. Between MIR, item #30 and this form, all participants in each activity must be accounted for. The component and activity codes used in completion of item #30 should be used here so that the two tables match. See definitions below table for further instructions.

Component Code	Activity Code	(1) Group I.D.	(2) Test Used	(3) Total N	(4) Number Tested/ Analyzed	(5) Participants Not Tested/ Analyzed		(6) Reasons why students were not tested, or if tested, were not analyzed	
						N	%		Number/ Reason
6 0 9 1 5	7 2 0	801	MAT	1175	927	248	22	Insufficient achievment data	
								attrition due to drop out	248
6 0 9 1 6	7 2 0	801	MAT	1950	1535	415	21	Insufficient achievment data	
								attrition due to drop out from program.	415

(1) Identify the participants by specific grade level (e.g., grade 3, grade 9). Where several grades are combined, enter the last two digits of the component code.
(2) Identify the test used and year of publication (MAT-70, SDAT-74, etc.).
(3) Number of participants in the activity.
(4) Number of participants included in the pre and posttest calculations found on item#30.
(5) Number and percent of participants not tested and/or not analyzed on item#30.
(6) Specify all reasons why students were not tested and/or analyzed. For each reason specified, provide a separate number count. If any further documentation is available, please attach to this form. If further space is needed to specify and explain data loss, attach additional pages to this form.